



TEST REPORT

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FCC ID: 2AKIT-PS-S02

Product Name: Presence Sensor FP2

Model: PS-S02E, PS-S02D

Standard(s): 47 CFR Part 15, Subpart C(15.255)
ANSI C63.10-2013

The above equipment has been tested and found compliant with the requirement of the relative standards by China Certification ICT Co., Ltd (Dongguan)

Report Number: CR221157696-00A

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Test Facility

The Test site used by China Certification ICT Co., Ltd (Dongguan) to collect test data is located on the No. 113, Pingkang Road, Dalang Town, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 442868, the FCC Designation No. : CN1314.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0123.

Declarations

China Certification ICT Co., Ltd (Dongguan) is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol “▲”. Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
1.0	CR221157696-00A	Original Report	2023/2/4

1. GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

EUT Name:	Presence Sensor FP2
EUT Model:	PS-S02E
Multiple Models:	PS-S02D
Operation Frequency Range:	Mode 1: 60-63.35 GHz Mode 2: 60.60-63.78 GHz
Modulation Type:	FMCW
Rated Input Voltage:	DC 5V from USB
Serial Number:	1SR6-1
EUT Received Date:	2022/12/02
EUT Received Status:	Good

Note: The Multiple models are electrically identical with the test model. Please refer to the declaration letter for more detail, which was provided by manufacturer.

Antenna Information Detail▲:

Antenna Type	input impedance (Ohm)	Antenna Gain /Frequency Range	§15.203, Requirement
Microstrip Patch	50	5.0 dBi/60~64GHz	Compliance

The Method of §15.203 Compliance:

- Antenna must be permanently attached to the unit.
- Antenna must use a unique type of connector to attach to the EUT.
- Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

Accessory Information:

Accessory Description	Manufacturer	Model	Parameters
USB Cable	Unknown	Unknown	Unshielded, 2m

1.2 Description of Test Configuration

1.2.1 EUT Operation Condition:

EUT Operation Mode:	The system was configured for testing in Engineering Mode, which was provided by the manufacturer. The device has 3T4R, 3TX simultaneously transmit.
Equipment Modifications:	No
EUT Exercise Software:	No
Engineering Mode was provided by manufacturer ▲. The maximum power was configured default setting.	

1.2.2 Support Equipment List and Details

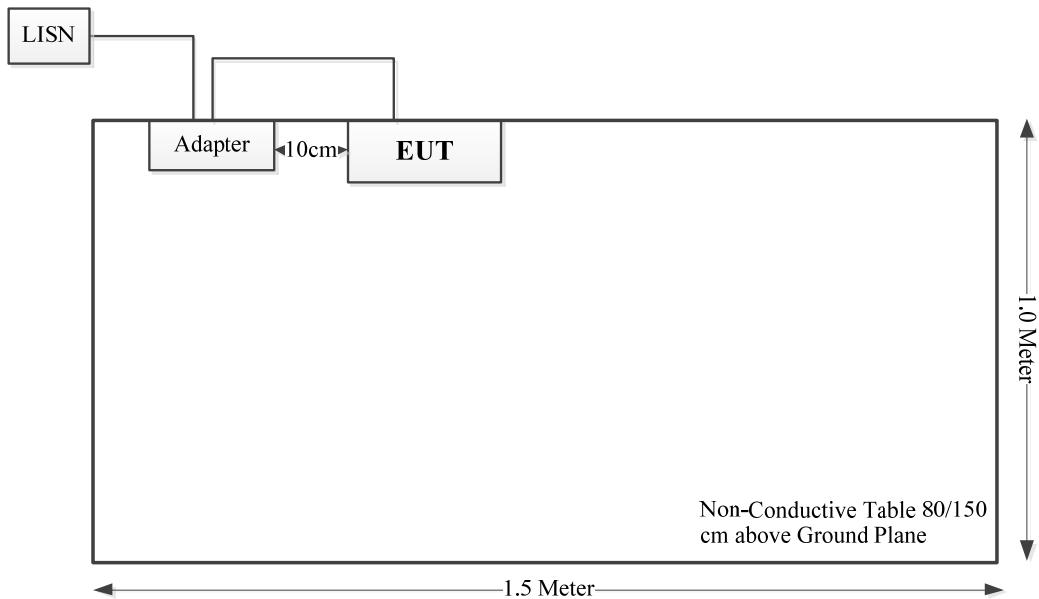
Manufacturer	Description	Model	Serial Number
Lumi United Technology Co., Ltd	Adapter	MDY-08-ET	1A422105116267C

1.2.3 Support Cable List and Details

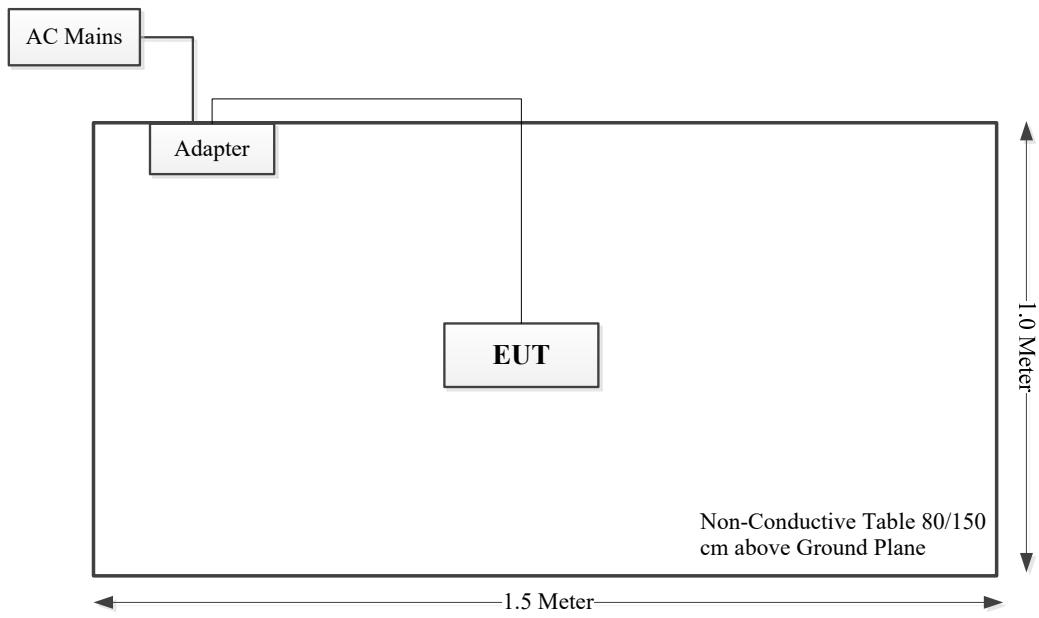
Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
/	/	/	/	/	/

1.2.4 Block Diagram of Test Setup

Conducted emissions:



Radiated emissions:



1.3 FAR Field Boundary Calculations

The far-field boundary is given in ANSI C63.10-2013:

$$R_m = 2D^2 / \lambda$$

Where:

D is the largest dimension of the antenna aperture in m and

λ is the free-space wavelength in m at the frequency of measurement.

The minimum test distance for the frequency range 40GHz-200GHz determine as below:

Model	Frequency Range (GHz)	Largest Dimension of the Horn Antenna (mm)	Minimum Test Distance R _m (m)
M19RH	40-60	46.3	0.57
861V/385	50-75	43.7	0.64
M12RH	60-90	30.02	0.36
M08RH	90-140	19.7	0.23
M05RH	140-220	12.5	0.30

Note: The test distances used were 1.0 m from 40 GHz to 90 GHz, and 0.5 m from 90 GHz to 200 GHz, it can be seen that the EUT was always in the Far-field of the Receive Antenna during all Radiated Emissions Tests.

1.4 Measurement Uncertainty

Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
Unwanted Emissions, radiated	30M~200MHz: 4.15 dB, 200M~1GHz: 5.61 dB, 1G~6GHz: 5.14 dB, 6G~18GHz: 5.93 dB, 18G~26.5G: 5.47 dB, 26.5G~40G: 5.63 dB 40~60G: 4.83dB, 60G~90G: 4.94dB, 90G~140G: 5.46dB, 140G~220G: 6.00dB
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	2.8 dB (150 kHz to 30 MHz)

2. SUMMARY OF TEST RESULTS

Standard(s)/Rule(s)	Description of Test	Result
§15.207(a)	Conduction Emissions	Compliant
15.205, §15.209, §15.255(d)	Radiated Emissions	Compliant
§15.215	20dB Emission Bandwidth	Compliant
§15.255(c)(3)(4) and (e)	Equivalent Isotropically Radiated Power (EIRP)	Compliant
§15.255(c)(3)(4) and (e)	Peak Conducted Output Power	Compliant
§15.255 (f)	Frequency Stability	Compliant
§15.255 (a)(h)	Operation Restriction And Group Installation	Compliant
§15.203	Antenna Requirement	Compliant
§1.1307	RF Exposure Evaluation	Compliant

3. REQUIREMENTS AND TEST PROCEDURES

3.1 AC Line Conducted Emissions

3.1.1 Applicable Standard

FCC§15.207(a).

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

(b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

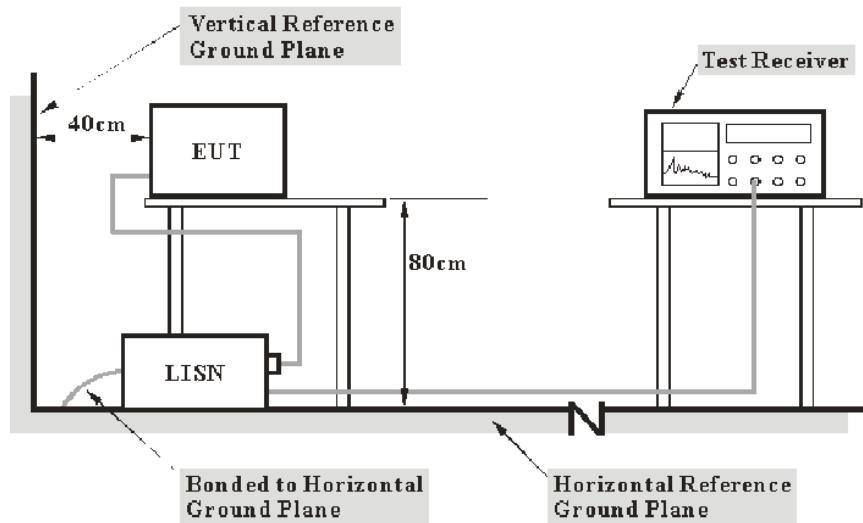
(1) For carrier current system containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

(2) For all other carrier current systems: 1000 μ V within the frequency band 535-1705 kHz, as measured using a 50 μ H/50 ohms LISN.

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits in §15.205, §15.209, §15.221, §15.223, or §15.227, as appropriate.

(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

3.1.2 EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

3.1.3 EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

3.1.4 Test Procedure

During the conducted emission test, the EUT was connected to the outlet of the first LISN.

The frequency and amplitude of the six highest ac power-line conducted emissions relative to the limit, measured over all the current-carrying conductors of the EUT power cords, and the operating frequency or frequency to which the EUT is tuned (if appropriate), should be reported, unless such emissions are more than 20 dB below the limit. AC power-line conducted emissions measurements are to be separately carried out only on each of the phase ("hot") line(s) and (if used) on the neutral line(s), but not on the ground [protective earth] line(s). If less than six emission frequencies are within 20 dB of the limit, then the noise level of the measuring instrument at representative frequencies should be reported. The specific conductor of the power-line cord for each of the reported emissions should be identified. Measure the six highest emissions with respect to the limit on each current-carrying conductor of each power cord associated with the EUT (but not the power cords of associated or peripheral equipment that are part of the test configuration). Then, report the six highest emissions with respect to the limit from among all the measurements identifying the frequency and specific current-carrying conductor identified with the emission. The six highest emissions should be reported for each of the current-carrying conductors, or the six highest emissions may be reported over all the current-carrying conductors.

3.1.5 Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$\text{Result} = \text{Reading} + \text{Factor}$$

Factor = attenuation caused by cable loss + voltage division factor of AMN

The "Margin" column of the following data tables indicates the degree of compliance within the applicable limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Result}$$

3.2 Radiated Emissions

3.2.1 Applicable Standard

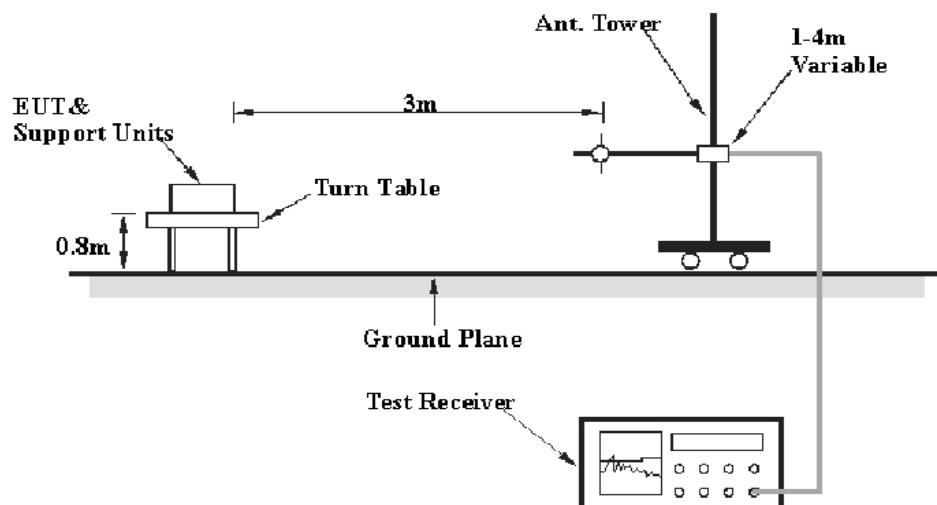
FCC §15.255

(d) Limits on spurious emissions:

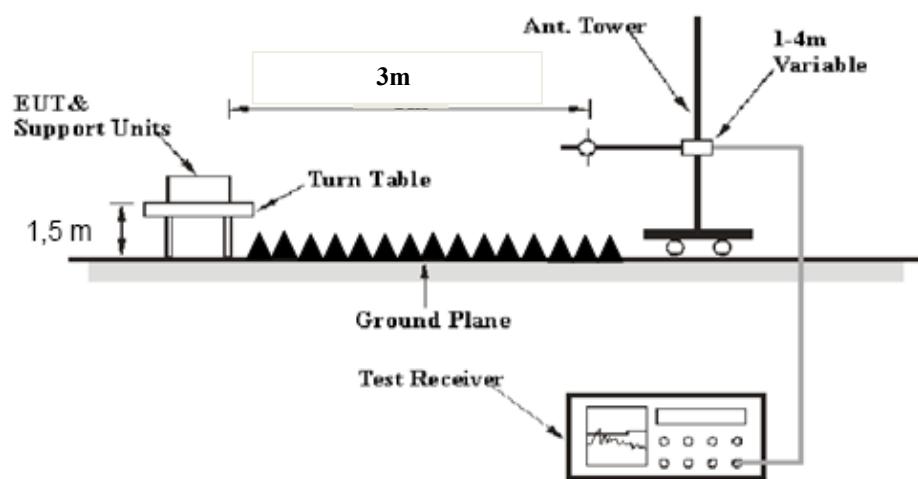
- (1) The power density of any emissions outside the 57-71 GHz band shall consist solely of spurious emissions.
- (2) Radiated emissions below 40 GHz shall not exceed the general limits in § 15.209.
- (3) Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm² at a distance of 3 meters.
- (4) The levels of the spurious emissions shall not exceed the level of the fundamental emission.

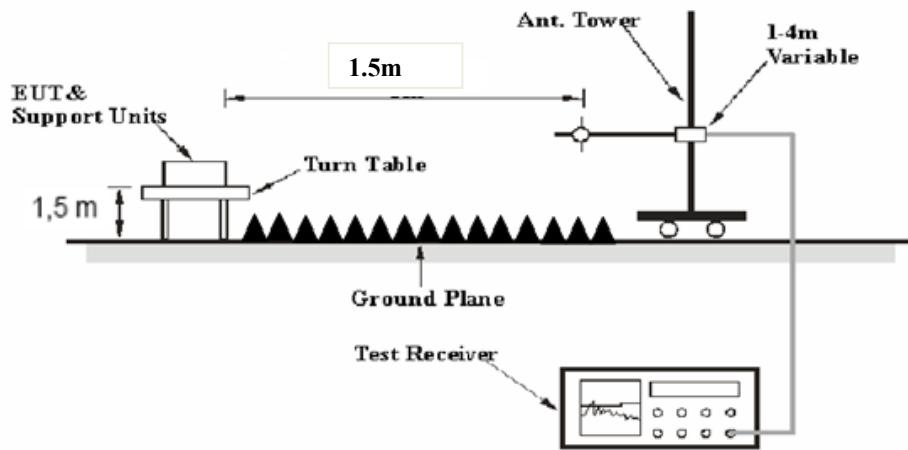
3.2.2 EUT Setup

Below 1GHz:



1-26.5 GHz:



26.5-40 GHz:**Above 40GHz:**

The antenna is scanned around the entire perimeter surface of the EUT, in both horizontal and vertical polarizations, at the distance of 1.0 m from 40 GHz to 90 GHz, and 0.5 m from 90 GHz to 200 GHz.

The radiated emission and out of band emission tests were performed in the 3 meters chamber test site A, using the setup accordance with the ANSI C63.10-2013 The specification used was the FCC 15.209/15.205 and FCC 15.255 limits.

3.2.3 EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 200 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
1-40 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave
40 GHz – 200 GHz	1MHz	3 MHz	/	PK

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

3.2.4 Test Procedure

Refer to ANSI C63.10-2013 Clauses 9.9, 9.12, and 9.13.

A Maximizing procedure was performed to ensure that the highest emissions from the EUT were actually measured in all of the Test Arrangements of the EUT and Local Support Equipment.

In accordance with FCC Rules Part 15 Subpart A Section 15.35, from 30 MHz to 1 GHz all radiated emissions measurements were made using a Quasi-peak Detector, and from 1 GHz to 40 GHz, all radiated emissions measurements were made using a Peak Detector and CISPR Average Detector. In accordance with FCC Rules Part 15 Subpart C Section 15.255, from 40 GHz to 200 GHz, all radiated emissions measurements were made using a Peak Detector.

According to C63.10, the 26.5-40GHz test result shall be extrapolated to the specified distance using an extrapolation factor of 20dB/decade from 3m to 1.5m

Distance extrapolation factor = $20 \log (\text{specific distance [3m]}/\text{test distance [1.5m]})$ dB= 6.02 dB

All emissions under the average limit and under the noise floor have not recorded in the report.

3.2.5 Corrected Amplitude & Margin Calculation

The basic equation is as follows:

Factor = Antenna Factor + Cable Loss - Amplifier Gain

For 30MHz-1GHz:

Result = Reading + Factor

For 1GHz-40GHz

Result = Reading + Factor - Distance extrapolation Factor

The “Margin” column of the following data tables indicates the degree of compliance within the applicable limit. The equation for margin calculation is as follows:

Margin = Limit – Result

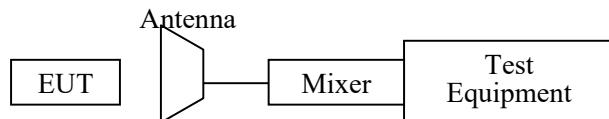
3.3 20dB Emission Bandwidth:

3.3.1 Applicable Standard

FCC §15.215

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

3.3.2 EUT Setup



3.3.3 Test Procedure

- a) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, unless otherwise specified by the applicable requirement.
- b) Set the video bandwidth (VBW) $\geq 3 \times \text{RBW}$.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

3.4 Equivalent Isotropically Radiated Power (EIRP)

3.4.1 Applicable Standard

FCC §15.255(c)

(c) Within the 57-71 GHz band, emission levels shall not exceed the following equivalent isotropically radiated power (EIRP):

- (3) For fixed field disturbance sensors other than those operating under the provisions of paragraph (c)(2) of this section, and short-range devices for interactive motion sensing, the peak transmitter conducted output power shall not exceed -10 dBm and the peak EIRP level shall not exceed 10 dBm.
- (4) The peak power shall be measured with an RF detector that has a detection bandwidth that encompasses the 57-71 GHz band and has a video bandwidth of at least 10 MHz. The average emission levels shall be measured over the actual time period during which transmission occurs.

3.4.2 Test Procedure

Refer to ANSI C63.10-2013 Clause 9.11

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

3.5 Peak Conducted Output Power

3.5.1 Applicable Standard

FCC §15.255(c)

(c) Within the 57-71 GHz band, emission levels shall not exceed the following equivalent isotropically radiated power (EIRP):

- (3) For fixed field disturbance sensors other than those operating under the provisions of paragraph (c)(2) of this section, and short-range devices for interactive motion sensing, the peak transmitter conducted output power shall not exceed -10 dBm and the peak EIRP level shall not exceed 10 dBm.
- (4) The peak power shall be measured with an RF detector that has a detection bandwidth that encompasses the 57-71 GHz band and has a video bandwidth of at least 10 MHz. The average emission levels shall be measured over the actual time period during which transmission occurs.

3.5.2 Test Procedure

Refer to ANSI C63.10-2013 Clause 9.7: equation to calculate power output.

3.6 Operation Restriction And Group Installation

3.6.1 Applicable Standard

§15.255 (a) Operation under the provisions of this section is not permitted for the following products:
(1) Equipment used on aircraft or satellites.

(2) Field disturbance sensors, including vehicle radar systems, unless the field disturbance sensors are employed for fixed operation. For the purposes of this section, the reference to fixed operation includes field disturbance sensors installed in fixed equipment, even if the sensor itself moves within the equipment.

§15.255 (h) Any transmitter that has received the necessary FCC equipment authorization under the rules of this chapter may be mounted in a group installation for simultaneous operation with one or more other transmitter(s) that have received the necessary FCC equipment authorization, without any additional equipment authorization. However, no transmitter operating under the provisions of this section may be equipped with external phase-locking inputs that permit beam-forming arrays to be realized.

3.6.2 Result of Operation Restriction

The Manufacturer declared that the EUT will not be advertised or sold for use on aircraft or satellites. The user manual includes a statement that cautions users that it is not permitted to use the product on aircraft or satellites.

3.6.3 Result of Group installation

The frequency, amplitude and phase of the transmit signal are set within the EUT. There are no external phase-locking inputs or any other means of combining two or more units together to realize a beam-forming array

3.7 Antenna Requirement

3.7.1 Applicable Standard

FCC §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.
- c. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

3.7.2 Judgment

Please refer to the Antenna Information detail in Section 1.

4. TEST DATA AND RESULTS

4.1 AC Line Conducted Emissions

Serial Number:	1SR6-1	Test Date:	2022/12/06
Test Site:	CE	Test Mode:	Transmitting(Low channel was the worst)
Tester:	Vic Du	Test Result:	Pass

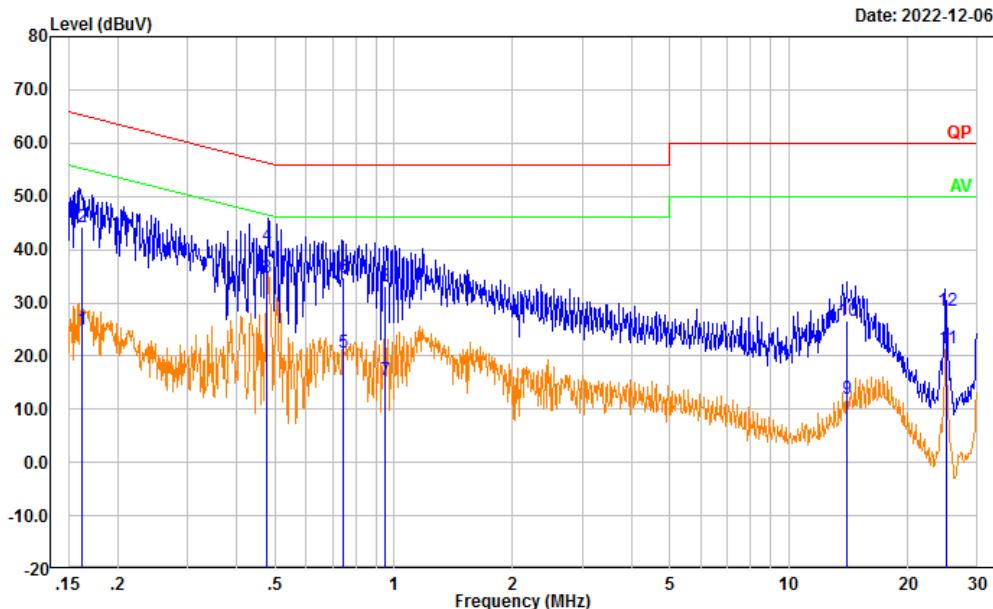
Environmental Conditions:					
Temperature: (°C)	21.8	Relative Humidity: (%)	46	ATM Pressure: (kPa)	101.4

Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	LISN	ENV216	101134	2022/04/01	2023/03/31
R&S	EMI Test Receiver	ESR3	102726	2022/07/15	2023/07/14
MICRO-COAX	Coaxial Cable	UTIFLEX	C-0200-01	2022/08/07	2023/08/06
Audix	Test Software	E3	190306 (V9)	N/A	N/A

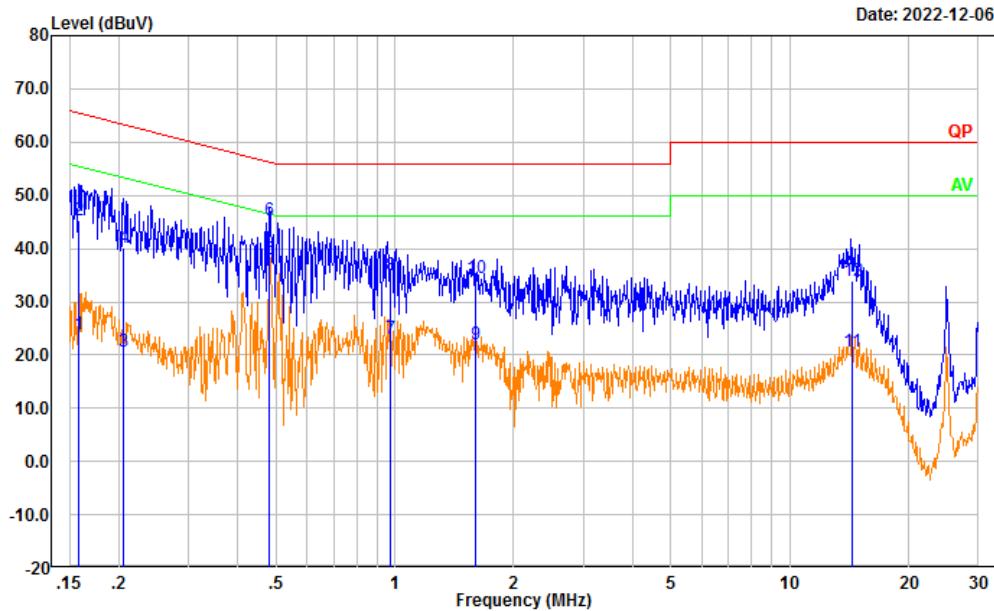
* Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Mode: Transmitting
Port: Line
Note:



No.	Frequency (MHz)	Reading (dB μ V)	Factor (dB)	Result (dB μ V)	Limit (dB μ V)	Margin (dB)	Detector
1	0.162	15.51	9.61	25.12	55.36	30.24	Average
2	0.162	34.65	9.61	44.26	65.36	21.10	QP
3	0.478	25.02	9.61	34.63	46.37	11.74	Average
4	0.478	31.07	9.61	40.68	56.37	15.69	QP
5	0.742	10.97	9.62	20.59	46.00	25.41	Average
6	0.742	25.21	9.62	34.83	56.00	21.17	QP
7	0.950	5.91	9.62	15.53	46.00	30.47	Average
8	0.950	23.62	9.62	33.24	56.00	22.76	QP
9	14.013	2.18	9.68	11.86	50.00	38.14	Average
10	14.013	17.04	9.68	26.72	60.00	33.28	QP
11	25.093	11.77	9.81	21.58	50.00	28.42	Average
12	25.093	18.65	9.81	28.46	60.00	31.54	QP

Test Mode: Transmitting
Port: neutral
Note:



No.	Frequency (MHz)	Reading (dB μ V)	Factor (dB)	Result (dB μ V)	Limit (dB μ V)	Margin (dB)	Detector
1	0.159	14.31	9.61	23.92	55.52	31.60	Average
2	0.159	35.57	9.61	45.18	65.52	20.34	QP
3	0.206	11.01	9.61	20.62	53.37	32.75	Average
4	0.206	30.49	9.61	40.10	63.37	23.27	QP
5	0.481	28.44	9.61	38.05	46.32	8.27	Average
6	0.481	35.77	9.61	45.38	56.32	10.94	QP
7	0.971	13.34	9.62	22.96	46.00	23.04	Average
8	0.971	25.38	9.62	35.00	56.00	21.00	QP
9	1.601	12.34	9.63	21.97	46.00	24.03	Average
10	1.601	24.78	9.63	34.41	56.00	21.59	QP
11	14.387	10.85	9.68	20.53	50.00	29.47	Average
12	14.387	24.22	9.68	33.90	60.00	26.10	QP

4.2 Radiation Spurious Emissions

Serial Number:	1SR6-1	Test Date:	2022/12/11~2022/12/16
Test Site:	966-2, 966-1	Test Mode:	Transmitting
Tester:	Carl Xue, Mack Huang	Test Result:	Pass

Environmental Conditions:					
Temperature: (°C)	22.2~22.4	Relative Humidity: (%)	51~53	ATM Pressure: (kPa)	101.2~101.3

Test Equipment List and Details:					
Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sunol Sciences	Antenna	JB6	A082520-5	2020/10/19	2023/10/18
R&S	EMI Test Receiver	ESR3	102724	2022/07/15	2023/07/14
TIMES MICROWAVE	Coaxial Cable	LMR-600-UltraFlex	C-0470-02	2022/07/17	2023/07/16
TIMES MICROWAVE	Coaxial Cable	LMR-600-UltraFlex	C-0780-01	2022/07/17	2023/07/16
Sonoma	Amplifier	310N	186165	2022/07/17	2023/07/16
Audix	Test Software	E3	201021 (V9)	N/A	N/A
ETS-Lindgren	Horn Antenna	3115	9912-5985	2020/10/13	2023/10/12
R&S	Spectrum Analyzer	FSV40	101591	2022/07/15	2023/07/14
MICRO-COAX	Coaxial Cable	UFA210A-1-1200-70U300	217423-008	2022/08/07	2023/08/06
MICRO-COAX	Coaxial Cable	UFA210A-1-2362-300300	235780-001	2022/08/07	2023/08/06
Mini	Pre-amplifier	ZVA-183-S+	5969001149	2022/11/09	2023/11/08
PASTERNACK	Horn Antenna	PE9852/2F-20	112002	2021/02/05	2024/02/04
AH	Preamplifier	PAM-1840VH	190	2022/11/09	2023/11/08
MICRO-COAX	Coaxial Cable	UFB142A-1-2362-200200	235772-001	2022/08/07	2023/08/06
PASTERNACK	Horn Antenna	PE9850/2F-20	072001	2021/02/05	2024/02/04
OML	Harmonic Mixer	WR19/M19HWD	U60314-1	2020/10/16	2023/10/15
OML	Horn Antenna	M19RH	11648-03	2020/10/16	2023/10/15
OML	Harmonic Mixer	WR12/M12HWD	E60119-1	2020/10/17	2023/10/16
OML	Horn Antenna	M12RH	E60119-2	2020/10/18	2023/10/17
OML	Harmonic Mixer	WR08/M08HWD	F60315-1	2020/10/22	2023/10/21
OML	Horn Antenna	M08RH	F60315-2	2020/10/24	2023/10/23
OML	Harmonic Mixer	WR05/M05HWD	G60107-1	2020/10/25	2023/10/24
OML	Horn Antenna	M05RH	G60107-2	2020/10/26	2023/10/25

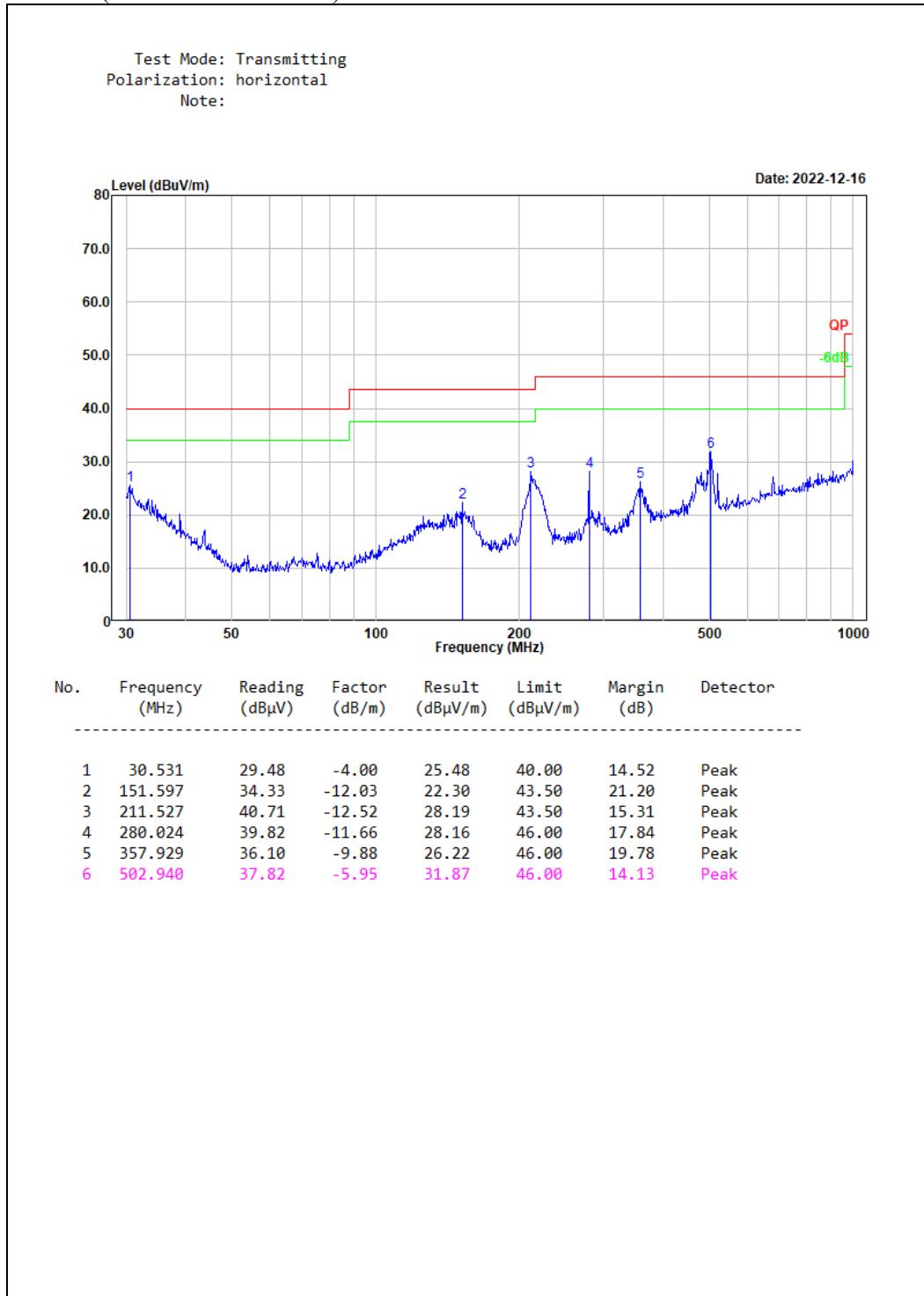
* Statement of Traceability: China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data:

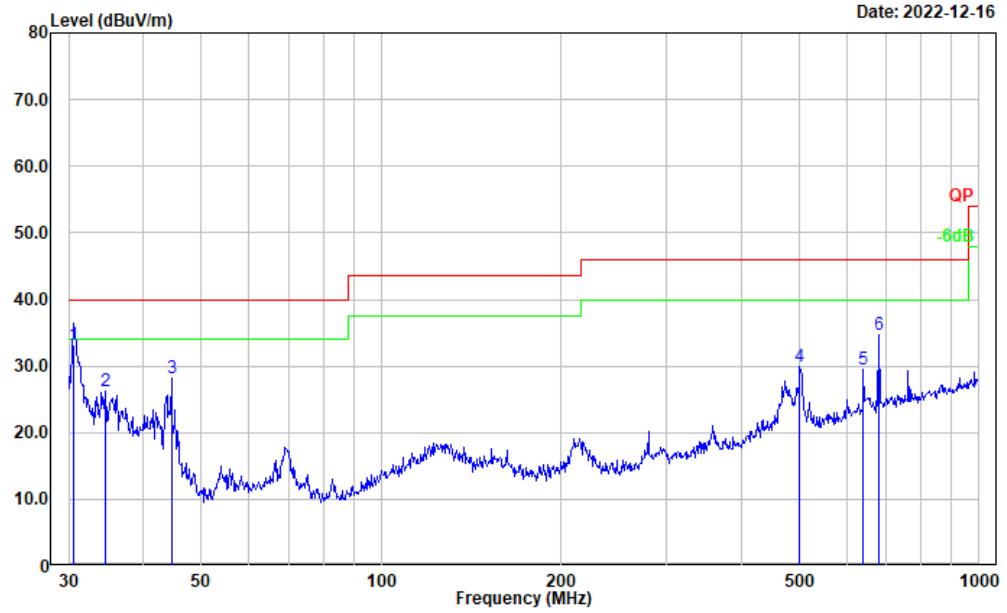
Please refer to the below table and plots.

Note: The device can be mounted in multiple orientations, test was performed with X,Y, Z Axis according to C63.10 figure 8, the worst orientation was photographed and it's data was recorded.

1) 30MHz-1GHz(Chain 0 was the worst):



Test Mode: Transmitting
Polarization: vertical
Note:



No.	Frequency (MHz)	Reading (dB μ V)	Factor (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector
1	30.615	37.29	-4.07	33.22	40.00	6.78	QP
2	34.517	33.42	-7.09	26.33	40.00	13.67	Peak
3	44.587	42.09	-14.00	28.09	40.00	11.91	Peak
4	501.179	35.90	-5.99	29.91	46.00	16.09	Peak
5	640.611	33.77	-4.33	29.44	46.00	16.56	Peak
6	679.960	38.42	-3.76	34.66	46.00	11.34	Peak

2) 1GHz-40GHz:**Mode 1:**

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
	Reading (dB μ V)	Detector					
Test Frequency: 60 GHz							
3227.40	38.79	PK	H	6.84	45.63	74.00	28.37
3227.40	26.40	AV	H	6.84	33.24	54.00	20.76
3227.40	37.06	PK	V	6.84	43.90	74.00	30.10
3227.40	25.03	AV	V	6.84	31.87	54.00	22.13
24313.30	49.48	PK	H	5.87	55.35	74.00	18.65
24313.30	36.24	AV	H	5.87	42.11	54.00	11.89
24313.30	52.39	PK	V	5.87	58.26	74.00	15.74
24313.30	40.20	AV	V	5.87	46.07	54.00	7.93
29851.30	48.30	PK	H	12.44	54.72	74.00	19.28
29851.30	35.15	AV	H	12.44	41.57	54.00	12.43
29851.30	51.24	PK	V	12.44	57.66	74.00	16.34
29851.30	38.12	AV	V	12.44	44.54	54.00	9.46
Test Frequency: 62 GHz							
3268.20	37.93	PK	H	6.94	44.87	74.00	29.13
3268.20	25.47	AV	H	6.94	32.41	54.00	21.59
3268.20	36.66	PK	V	6.94	43.60	74.00	30.40
3268.20	24.33	AV	V	6.94	31.27	54.00	22.73
21671.00	50.76	PK	H	5.09	55.85	74.00	18.15
21671.00	37.38	AV	H	5.09	42.47	54.00	11.53
21671.00	51.89	PK	V	5.09	56.98	74.00	17.02
21671.00	38.45	AV	V	5.09	43.54	54.00	10.46
30326.60	51.03	PK	H	11.72	56.73	74.00	17.27
30326.60	38.02	AV	H	11.72	43.72	54.00	10.28
30326.60	50.46	PK	V	11.72	56.16	74.00	17.84
30326.60	37.23	AV	V	11.72	42.93	54.00	11.07
Test Frequency: 63.35 GHz							
3241.00	37.78	PK	H	6.87	44.65	74.00	29.35
3241.00	25.39	AV	H	6.87	32.26	54.00	21.74
3241.00	40.86	PK	V	6.87	47.73	74.00	26.27
3241.00	28.43	AV	V	6.87	35.30	54.00	18.70
21239.10	51.82	PK	H	5.34	57.16	74.00	16.84
21239.10	38.41	AV	H	5.34	43.75	54.00	10.25
21239.10	49.95	PK	V	5.34	55.29	74.00	18.71
21239.10	36.48	AV	V	5.34	41.82	54.00	12.18
39481.50	51.89	PK	H	16.14	62.01	74.00	11.99
39481.50	38.45	AV	H	16.14	48.57	54.00	5.43
39481.50	53.42	PK	V	16.14	63.54	74.00	10.46
39481.50	40.21	AV	V	16.14	50.33	54.00	3.67

Mode 2:

Frequency (MHz)	Receiver		Polar (H/V)	Factor (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
	Reading (dB μ V)	Detector					
Test Frequency: 60.62 GHz							
3227.40	38.57	PK	H	6.84	45.41	74.00	28.59
3227.40	26.15	AV	H	6.84	32.99	54.00	21.01
3227.40	37.24	PK	V	6.84	44.08	74.00	29.92
3227.40	24.78	AV	V	6.84	31.62	54.00	22.38
24313.30	49.23	PK	H	5.87	55.10	74.00	18.90
24313.30	35.99	AV	H	5.87	41.86	54.00	12.14
24313.30	52.44	PK	V	5.87	58.31	74.00	15.69
24313.30	39.95	AV	V	5.87	45.82	54.00	8.18
29851.30	48.05	PK	H	12.44	54.47	74.00	19.53
29851.30	34.90	AV	H	12.44	41.32	54.00	12.68
29851.30	50.99	PK	V	12.44	57.41	74.00	16.59
29851.30	37.87	AV	V	12.44	44.29	54.00	9.71
Test Frequency: 62 GHz							
3268.20	38.16	PK	H	6.94	45.10	74.00	28.90
3268.20	25.73	AV	H	6.94	32.67	54.00	21.33
3268.20	36.82	PK	V	6.94	43.76	74.00	30.24
3268.20	24.56	AV	V	6.94	31.50	54.00	22.50
21671.00	50.99	PK	H	5.09	56.08	74.00	17.92
21671.00	37.61	AV	H	5.09	42.70	54.00	11.30
21671.00	52.12	PK	V	5.09	57.21	74.00	16.79
21671.00	38.68	AV	V	5.09	43.77	54.00	10.23
30326.60	51.26	PK	H	11.72	56.96	74.00	17.04
30326.60	38.25	AV	H	11.72	43.95	54.00	10.05
30326.60	50.69	PK	V	11.72	56.39	74.00	17.61
30326.60	37.46	AV	V	11.72	43.16	54.00	10.84
Test Frequency: 63.78 GHz							
3241.00	37.46	PK	H	6.87	44.33	74.00	29.67
3241.00	25.47	AV	H	6.87	32.34	54.00	21.66
3241.00	40.54	PK	V	6.87	47.41	74.00	26.59
3241.00	28.37	AV	V	6.87	35.24	54.00	18.76
21239.10	51.50	PK	H	5.34	56.84	74.00	17.16
21239.10	38.09	AV	H	5.34	43.43	54.00	10.57
21239.10	49.63	PK	V	5.34	54.97	74.00	19.03
21239.10	36.16	AV	V	5.34	41.50	54.00	12.50
39481.50	51.57	PK	H	16.14	61.69	74.00	12.31
39481.50	38.13	AV	H	16.14	48.25	54.00	5.75
39481.50	53.16	PK	V	16.14	63.28	74.00	10.72
39481.50	39.92	AV	V	16.14	50.04	54.00	3.96

Result = Reading + Factor - Distance extrapolation Factor

For 1-26.5GHz:

Distance extrapolation Factor = 20 log (specific distance [3m]/test distance [3m]) dB = 0 dB

For 26.5-40GHz:

Distance extrapolation Factor = 20 log (specific distance [3m]/test distance [1.5m]) dB = 6.02 dB

40GHz-200GHz:**Mode 1:**

Frequency (GHz)	Receiver		Polar (H/V)	Factor (dB/m)	Field Strength (dB μ V/m)	Power Density (pW/cm ²)	Limit (pW/cm ²)
	Reading (dB μ V)	Detector					
Test Frequency: 60 GHz							
48.600	48.03	PK	H	40.13	78.62	19.30	90.00
48.600	47.88	PK	V	40.13	78.47	18.65	90.00
74.360	46.85	PK	H	44.15	81.46	37.12	90.00
74.360	47.07	PK	V	44.15	81.68	39.05	90.00
106.860	48.53	PK	H	47.19	80.16	27.52	90.00
106.860	51.45	PK	V	47.19	83.08	53.91	90.00
141.090	46.18	PK	H	48.94	79.56	23.97	90.00
141.090	47.31	PK	V	48.94	80.69	31.09	90.00
Test Frequency: 62 GHz							
48.540	50.66	PK	H	40.12	81.24	35.29	90.00
48.540	47.73	PK	V	40.12	78.31	17.97	90.00
86.120	44.11	PK	H	44.63	79.20	22.06	90.00
86.120	45.45	PK	V	44.63	80.54	30.04	90.00
115.800	47.98	PK	H	47.83	80.25	28.10	90.00
115.800	50.44	PK	V	47.83	82.71	49.51	90.00
144.200	46.69	PK	H	49.08	80.21	27.84	90.00
144.200	45.28	PK	V	49.08	78.80	20.12	90.00
Test Frequency: 63.35 GHz							
48.530	47.55	PK	H	40.12	78.13	17.24	90.00
48.530	47.46	PK	V	40.12	78.04	16.89	90.00
84.660	46.70	PK	H	44.45	81.61	38.43	90.00
84.660	46.74	PK	V	44.45	81.65	38.78	90.00
107.800	48.23	PK	H	47.31	79.98	26.40	90.00
107.800	50.90	PK	V	47.31	82.65	48.83	90.00
145.560	45.53	PK	H	49.14	79.11	21.61	90.00
145.560	47.32	PK	V	49.14	80.90	32.63	90.00

Mode 2:

Frequency (GHz)	Receiver		Polar (H/V)	Factor (dB/m)	Field Strength (dB μ V/m)	Power Density (pW/cm ²)	Limit (pW/cm ²)
	Reading (dB μ V)	Detector					
Test Frequency: 60.62 GHz							
48.600	48.03	PK	H	40.13	78.62	19.30	90.00
48.600	47.88	PK	V	40.13	78.47	18.65	90.00
74.360	46.85	PK	H	44.15	81.46	37.12	90.00
74.360	47.07	PK	V	44.15	81.68	39.05	90.00
106.860	48.53	PK	H	47.19	80.16	27.52	90.00
106.860	51.45	PK	V	47.19	83.08	53.91	90.00
141.090	46.18	PK	H	48.94	79.56	23.97	90.00
141.090	47.31	PK	V	48.94	80.69	31.09	90.00
Test Frequency: 62 GHz							
48.540	50.66	PK	H	40.12	81.24	35.29	90.00
48.540	47.73	PK	V	40.12	78.31	17.97	90.00
86.120	44.11	PK	H	44.63	79.20	22.06	90.00
86.120	45.45	PK	V	44.63	80.54	30.04	90.00
115.800	47.98	PK	H	47.83	80.25	28.10	90.00
115.800	50.44	PK	V	47.83	82.71	49.51	90.00
144.200	46.69	PK	H	49.08	80.21	27.84	90.00
144.200	45.28	PK	V	49.08	78.80	20.12	90.00
Test Frequency: 63.78 GHz							
48.530	47.55	PK	H	40.12	78.13	17.24	90.00
48.530	47.46	PK	V	40.12	78.04	16.89	90.00
84.660	46.70	PK	H	44.45	81.61	38.43	90.00
84.660	46.74	PK	V	44.45	81.65	38.78	90.00
107.800	48.23	PK	H	47.31	79.98	26.40	90.00
107.800	50.90	PK	V	47.31	82.65	48.83	90.00
145.560	45.53	PK	H	49.14	79.11	21.61	90.00
145.560	47.32	PK	V	49.14	80.90	32.63	90.00

Note:

Factor = Antenna Factor

Field Strength = Reading + Factor + 20log(d_{Meas}/d_{SpecLimit})

d_{Meas} is the measurement distance, in m

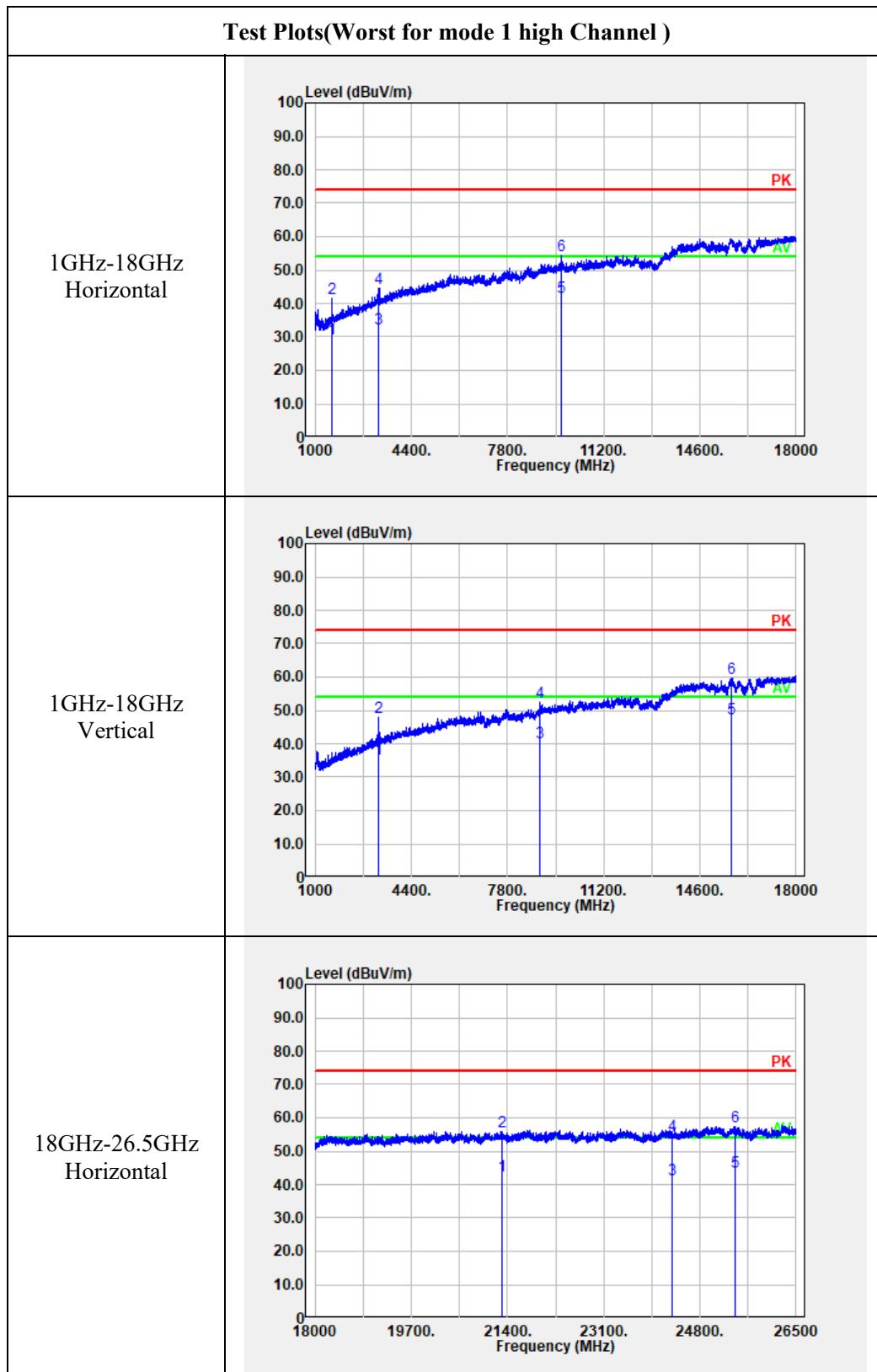
d_{SpecLimit} is the distance specified by the limit, in m

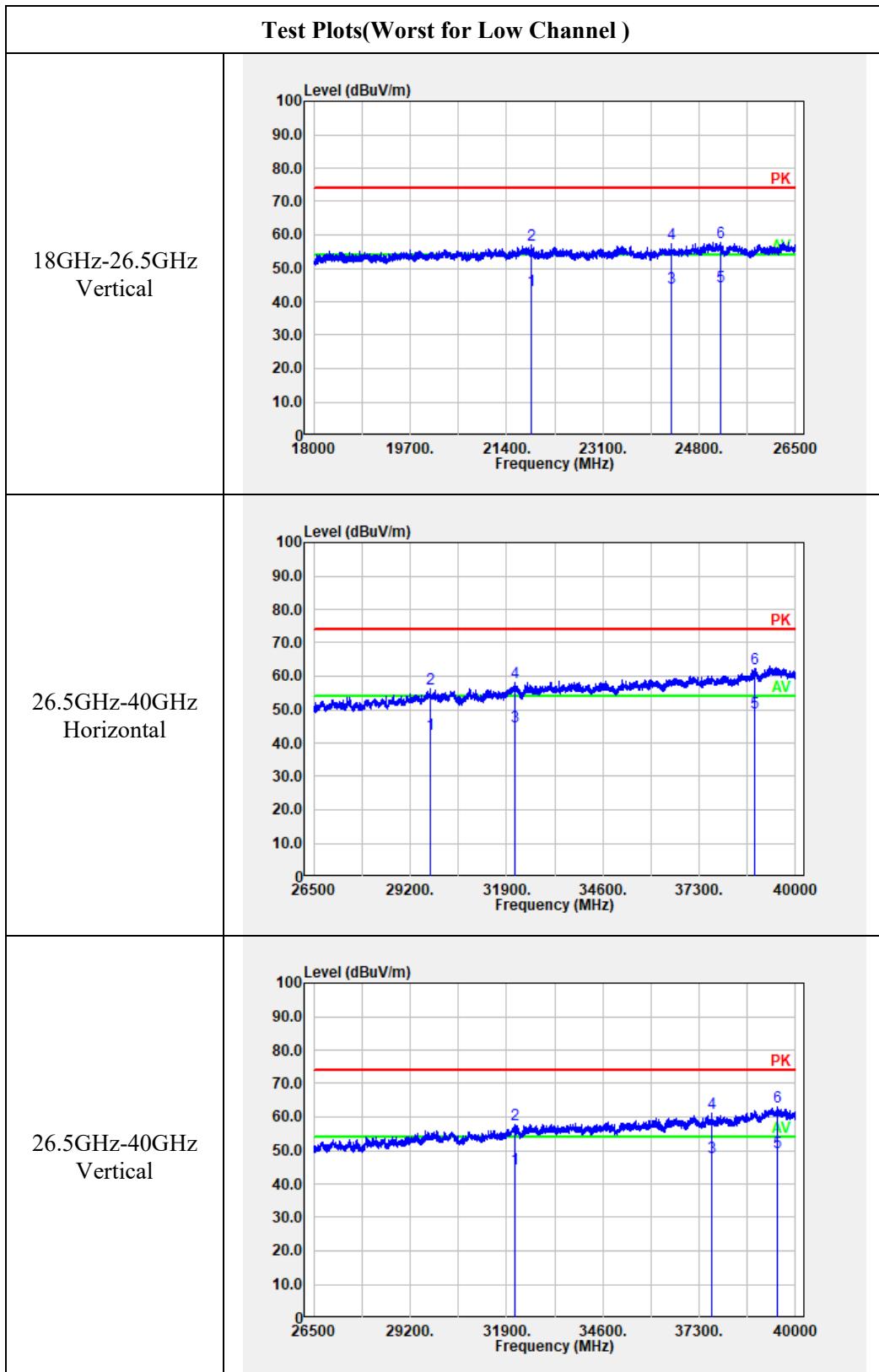
$$PD = \frac{E_{\text{SpecLimit}}^2}{377}$$

where

PD is the power density at the distance specified by the limit, in W/m²
 $E_{\text{SpecLimit}}$ is the field strength at the distance specified by the limit, in V/m

The Specified distance is 3m.





4.3 20 dB Emission Bandwidth:

Serial Number:	1SR6-1	Test Date:	2022/12/11
Test Site:	966-1	Test Mode:	Transmitting
Tester:	Mack Huang	Test Result:	N/A

Environmental Conditions:					
Temperature: (°C)	22.2	Relative Humidity: (%)	53	ATM Pressure: (kPa)	101.3

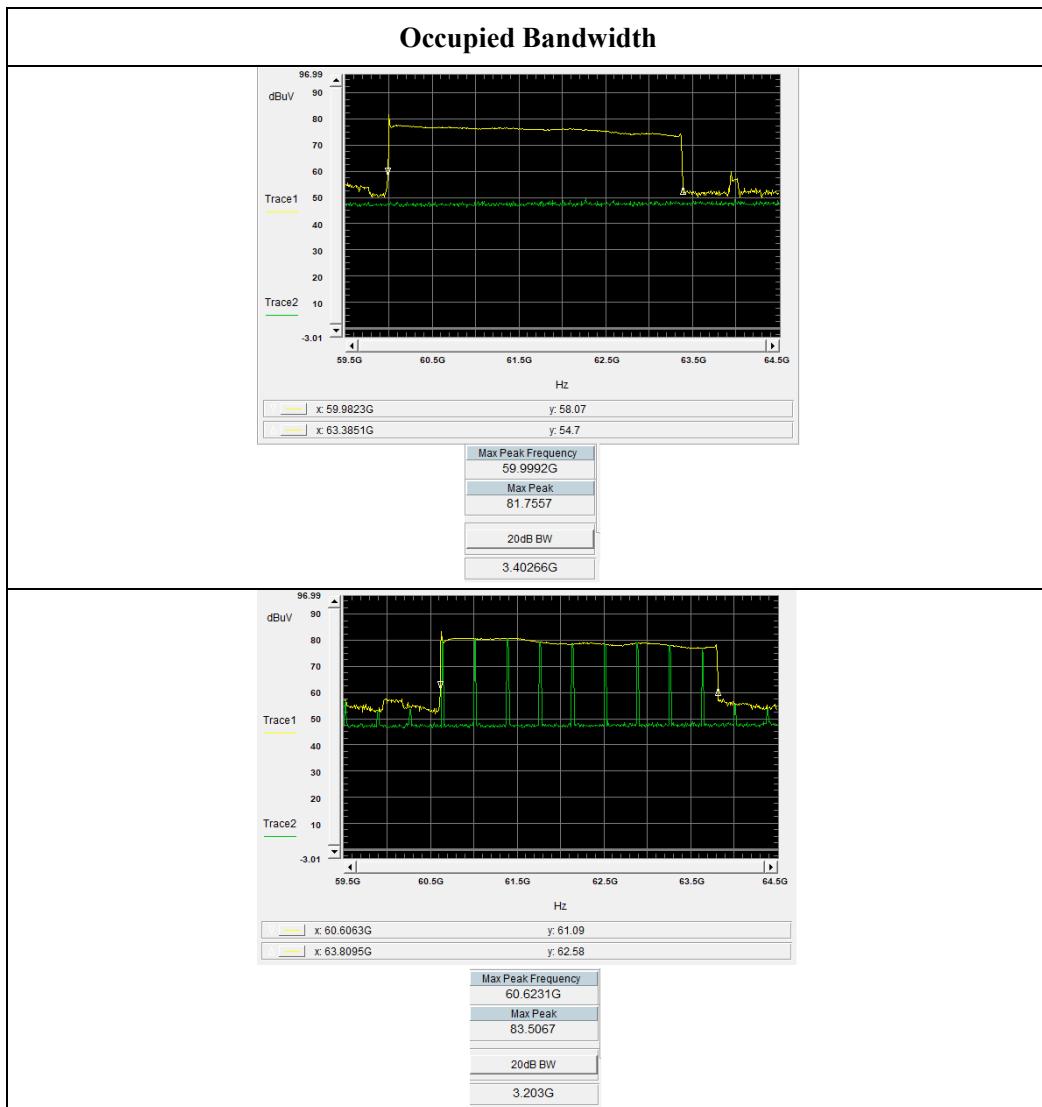
Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Spectrum Analyzer	E4440A	MY44303354	2022/07/15	2023/07/14
Agilent	Harmonic Mixer	Agilent 11970V	2521A01768	2020/11/08	2023/11/07
Flann Microwave	Horn Antenna	861V/385	738	2020/11/08	2023/11/07
BACL	Test Software	E4440A	V1.1	N/A	N/A

* **Statement of Traceability:** China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data:

Test Mode	20dB Emission Bandwidth (GHz)
Mode 1	3.403
Mode 2	3.203



4.4 Equivalent Isotropically Radiated Power (EIRP):

Serial Number:	1SR6-1	Test Date:	2022/12/11
Test Site:	966-1	Test Mode:	Transmitting
Tester:	Mack Huang	Test Result:	Pass

Environmental Conditions:

Temperature: (°C)	22.2	Relative Humidity: (%)	53	ATM Pressure: (kPa)	101.3
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Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Flann Micowave	Horn Antenna	861V/385	738	2020/11/08	2023/11/07
millitech	RF Detector	DET-15-RPFW0	A18521	2019/12/15	2022/12/15
Tektronix	Digital Phosphor Oscilloscope	TDS 3054	B015264	2022/11/18	2023/11/17

* **Statement of Traceability:** China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data:

Frequency (GHz)	DSO		Polar (H/V)	Substituted Level (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)
	Reading (mV)	Detector					
Mode 1							
60.00	0.00	PK	V	-68.95	5.00	-5.83	10
62.00	0.00	PK	V	-70.09	5.00	-6.68	10
63.35	0.00	PK	V	-70.38	5.00	-6.79	10
Mode 2							
60.62	0.00	PK	V	-69.29	5.00	-6.08	10
62.00	0.00	PK	V	-70.09	5.00	-6.68	10
63.78	0.00	PK	V	-70.47	5.00	-6.82	10

$$EIRP = E_{meas} + 20\log(Measurement\ distance) - 104.7$$

$$E_{meas} = 126.8 - 20\log(\lambda) + Substituted\ level - Antenna\ Gain$$

$$Measurement\ distance = 1m$$

4.5 Peak Conducted Output Power:

Serial Number:	1SR6-1	Test Date:	2022/12/11
Test Site:	966-1	Test Mode:	Transmitting
Tester:	Mack Huang	Test Result:	Pass

Environmental Conditions:

Temperature: (°C)	22.2	Relative Humidity: (%)	53	ATM Pressure: (kPa)	101.3
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Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Flann Micowave	Horn Antenna	861V/385	738	2020/11/08	2023/11/07
millitech	RF Detector	DET-15-RPFW0	A18521	2019/12/15	2022/12/15
Tektronix	Digital Phosphor Oscilloscope	TDS 3054	B015264	2022/11/18	2023/11/17

* **Statement of Traceability:** China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data:

Frequency (GHz)	Peak EIPR Power (dBm)	Antenna Gain (dBi)	Peak Conducted Power (dBm)	Limit (dBm)	Margin (dB)
Mode 1					
60.00	-5.83	5.00	-10.83	-10	0.83
62.00	-6.68	5.00	-11.68	-10	1.68
63.35	-6.79	5.00	-11.79	-10	1.79
Mode 2					
60.62	-6.08	5.00	-11.08	-10	1.08
62.00	-6.68	5.00	-11.68	-10	1.68
63.78	-6.82	5.00	-11.82	-10	1.82

Note:

For radiated emissions measurements, calculated transmitter conducted output power $P(\text{con})$
 $P(\text{con}) = \text{EIRP} - \text{Antenna gain(dBi)}$

4.6 Frequency Stability:

Serial Number:	1SR6-1	Test Date:	2022/12/11
Test Site:	RF	Test Mode:	Transmitting
Tester:	Mack Huang	Test Result:	Pass

Environmental Conditions:

Temperature: (°C)	22.5	Relative Humidity: (%)	54	ATM Pressure: (kPa)	101.3
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Test Equipment List and Details:

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Spectrum Analyzer	E4440A	MY44303354	2022/07/15	2023/07/14
Agilent	Harmonic Mixer	Agilent 11970V	2521A01768	2020/11/08	2023/11/07
Flann Microwave	Horn Antenna	861V/385	738	2020/11/08	2023/11/07
BACL	TEMP&HUMI Test Chamber	BTH-150-40	30174	2022/04/06	2023/04/05
UNI-T	Multimeter	UT39A+	C210582554	2022/09/29	2023/09/28
BACL	Test Software	E4440A	V1.1	N/A	N/A

* **Statement of Traceability:** China Certification ICT Co., Ltd (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data:

Mode 1

Temperature	Voltage	Frequency (GHz)			
		f _L	f _H	f _L Limit	f _H Limit
-20	5	59.98930	63.35950	57	71
-10	5	59.99520	63.35160	57	71
0	5	60.00710	63.34220	57	71
10	5	60.00450	63.35360	57	71
20	5	59.99920	63.35190	57	71
30	5	59.98920	63.34830	57	71
40	5	60.00120	63.35350	57	71
50	5	60.00690	63.34960	57	71
20	4.5	60.00240	63.35090	57	71
20	5.5	60.00640	63.35680	57	71

Mode 2

Temperature °C	Voltage V _{DC}	Frequency (GHz)			
		f _L	f _H	f _L Limit	f _H Limit
-20	5	60.61360	63.78710	57	71
-10	5	60.61800	63.78180	57	71
0	5	60.61740	63.78930	57	71
10	5	60.61510	63.79060	57	71
20	5	60.62310	63.78450	57	71
30	5	60.62750	63.78680	57	71
40	5	60.63250	63.78170	57	71
50	5	60.62360	63.79170	57	71
20	4.5	60.62060	63.79360	57	71
20	5.5	60.61940	63.79450	57	71

5. RF EXPOSURE EVALUATION

5.1 Applicable Standard

According to §1.1307(b)(3)(i)

(C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$.
1.34-30	$3,450 R^2/f^2$.
30-300	$3.83 R^2$.
300-1,500	$0.0128 R^2 f$.
1,500-100,000	$19.2R^2$.

5.2 Measurement Result

Frequency (GHz)	$\lambda/2\Pi$ (mm)	Distance (mm)	Exemption ERP		Maximum Conducted Power including Tune-up Tolerance (dBm)	Antenna Gain (dBi)	ERP (dBm)	MPE-Based Exemption
			(mW)	(dBm)				
60-63.78	0.80	200	768	28.85	-10	5	-7.15	Compliant

Result: The device compliant the MPE-Based Exemption at 20cm distances.

===== END OF REPORT =====